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**PROPOSAL TO IMPLEMENT
A REVISED SCOPE OF WORK
FOR DEAD CREEK SITES
REMEDIAL INVESTIGATION/
FEASIBILITY STUDY**

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Prepared for:

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1. INTRODUCTION

Ecology and Environment, Inc., (E & E) is pleased to provide this proposal to the Illinois Environmental Protection Agency (IEPA) for implementation of a revised scope of work for the remedial investigation/feasibility study (RI/FS) for 12 sites and six segments of Dead Creek (collectively known as the Dead Creek sites) in the towns of Sauget and Cahokia, St. Clair County, Illinois. The purpose of the revision is to enable the collection of sufficient data to achieve placement of the Dead Creek sites on the National Priorities List (NPL) or the State Remedial Action Priority List (SRAPL).

Section 2 of this proposal summarizes the project background and work completed to date. Section 3 provides a description of the objectives and approach for the revised scope of work, followed by two subsections detailing, respectively, E & E's approach to investigating the Hazard Ranking System (HRS) mechanism for placement of the site on the NPL or SRAPL; and E & E's approach to the Health Advisory mechanism for NPL qualification. Section 4 contains the project schedule; E & E's proposed cost estimates are provided in Section 5.

2. BACKGROUND

In May 1985, in response to an IEPA Request for Proposals (RFP), E & E submitted a proposal to conduct an RI/FS for the Dead Creek sites. The overall purpose of the RI/FS, as defined in the RFP, was to:

- Assess the cause, extent, and effects of the hazardous materials present in the project area;
- Identify and evaluate alternatives that might remedy the contamination problems that threaten environmental and/or public health, as determined by fieldwork conducted during the RI; and
- Recommend remedial alternatives on a site-by-site basis.

The 1985 RFP for the RI/FS was developed in response to problems that had been identified in the project area since 1980. Dead Creek had experienced periodic incidents involving smoldering materials caused by random dumping. When the problem was compounded by the death of a local resident's dog--apparently caused by chemical burns resulting from exposure to materials in the creekbed--IEPA initiated an expanded investigation of Dead Creek and the surrounding area. Preliminary soil and water samples obtained from Dead Creek and adjacent areas identified high levels of phosphorus, heavy metals, and polychlorinated biphenyls (PCBs). In 1980 and 1981, an additional limited study resulted in the report entitled "A Preliminary Hydrogeologic Investigation in the Northern Portion of Dead Creek and Vicinity," which documented extensive contamination of soil, surface water, and groundwater. Moreover, in addition to Dead Creek, the Sauget and Cahokia area has been used extensively for hazardous and nonhazardous waste disposal. A number of municipal and industrial waste landfills exist in the area, and locations initially developed as sand and gravel pits were filled with a variety of unknown materials. Local manufacturing and service facilities also have discharged wastes to surface water, soils, and groundwater in the project area.

At the initial September 25, 1985, meeting between IEPA and E & E following IEPA's selection of E & E as the RI/FS contractor, IEPA noted the critical importance of obtaining the data base necessary to place the Dead Creek sites and/or area on the NPL and/or SRAPL. Such placement would be achieved by showing that the sites merit such priority consideration because of the cause, extent, and effects of hazardous materials in the area. Placement on the NPL and/or SRAPL would cause Superfund and Illinois Hazardous Waste Fund monies to be made available for the necessary remedial activities. In addition, such placement would put significant pressure on responsible parties to participate in and provide monies for remedial activities.

In developing the specific tasks and investigations specified in the RI/FS RFP, IEPA had anticipated that background data compiled during the RI/FS--coupled with the results of the specified RI/FS sampling program--would be sufficient to assure placement of the sites and/or area on the NPL and/or SRAPL. Table 2-1 lists E & E's work completed to date. However, in completing RI/FS Task 4 (Additional Data Gathering), E & E determined that, although existing data were extensive, the data when combined with the results of the planned RI/FS field investigations would not provide the data base and documentation necessary to result in NPL/SRAPL placement; and that this was caused more by the technical complexities of the placement mechanisms than by the absence of environmental contamination in the area. Since the results of the RI/FS would have only limited benefit unless a site, sites, or area were on the NPL and/or SRAPL and monies were made available for remediation, IEPA and E & E concurred that a revised scope of work should be prepared and evaluated to assure that the purpose of the Illinois Hazardous Substances Pollution Contingency Plan is achieved. The purpose of this plan is to effectuate means for taking preventive or corrective actions, pursuant to the Environmental Protection Act, that are necessary wherever there is a release or a substantial threat of a release of a hazardous substance.

Accordingly, IEPA modified the RI/FS scope of work to include E & E's development and recommendation of a revised scope of work in an attempt to achieve placement of the Dead Creek sites and/or area on the NPL and/or SRAPL.

Table 2-1

CURRENT WORK STATUS

(E & E work performed since the execution of the Dead Creek RI/FS contract in September 1985)

- **Task 1, Initial Meeting.** Held in September 1985. A follow-up meeting was held in March 1986 to discuss the work plan; a scope-of-work meeting was held in June 1986 to discuss the direction of the project.
- **Task 2, Work Plan Requirements.** Mini-work plans and quality assurance project plans (QAPPs) were prepared for geophysical, topographic, and soil gas monitoring investigation to permit completion of these tasks prior to completion/approval of the complete project work plan. Both draft and final project work plans have been submitted to IEPA.
- **Task 3, Associated Support.** Site/topographic maps, along with an associated index map, have been prepared and submitted to IEPA.
- **Task 4, Additional Data Gathering.** A concentrated data-gathering effort uncovered a large amount of information for many of the sites in the project area. Additional data continue to be received. All the information is being organized, reviewed, and evaluated.
- **Task 5, Description of Current Situation.** Using data obtained and assembled in Task 4, a current situation report describing pertinent area and site-specific information has been prepared and submitted to IEPA. The report includes all of the useful data available from previous investigations and government agency files.
- **Task 6, Interim/Preliminary Reports.** These include the current situation report (submitted); project work plan (submitted); and preliminary remedial technologies report (nearing completion, to be submitted in the near future).
- **Task 7, Investigations.** In addition to the Task 3 topographic and survey work, Task 7 field investigations completed to date consist only of geophysical testing activities. The soil gas monitoring investigations were postponed due to unseasonably cold weather in November 1985 and have been rescheduled. All necessary field equipment has been assembled and prepared for the field.
- **Task 8, Preliminary Remedial Technologies.** A draft report examining and evaluating remedial technologies that may be applicable to the study area has been prepared and currently is undergoing final revision prior to submission to IEPA.
- **Task 11, Additional Support.** Monthly reports describing project technical and financial progress have been submitted since October 1985. E & E project staff members have supported IEPA at meetings with Monsanto and local government officials.

3. REVISED SCOPE OF WORK

The scope of work presented herein is designed to meet the IEPA objective of gathering sufficient data to result in placement of the Dead Creek sites and/or area on the NPL and/or SRAPL by showing the cause, extent, and impact of hazardous materials in the area.

There are three mechanisms for placing a site or sites on the NPL: an appropriate HRS score, designation by the State of a top-priority site/release, and determination of a significant threat to the public health and welfare and/or the environment. Since the State of Illinois already has a designated top-priority site/release, the HRS mechanism and the Health Advisory mechanism remain available for listing the Dead Creek sites on the NPL. (The listing of a site on the SRAPL can be achieved only by using the HRS mechanism; however, a score of 10.0 or greater but less than 28.5 is adequate for SRAPL listing--as compared to a score of 28.5 or greater for the NPL.)

- **The Hazard Ranking System (HRS) mechanism** involves use of the HRS model, developed and designed to rate the relative severity of a hazardous waste site as compared to other sites. The HRS computes a score from 1 to 100 for each candidate site. The score is based on the relative potential that the involved substances will cause hazardous situations, the likelihood and rate at which the substances may affect human and environmental receptors, and the severity and magnitude of potential effects.
- **The Health Advisory (HA) mechanism** allows the United States Environmental Protection Agency (USEPA) to include a site or release on the NPL if the following three criteria are met:
 - The Agency for Toxic Substances and Disease Registry (ATSDR) of the United States Department of Health and Human Services has issued a public health advisory recommending disassociation of individuals from the release;

- USEPA determines that the release poses a significant threat to public health; and
- USEPA anticipates that remedial response will be more cost-effective than removal response.

The scope of work presented in this proposal is designed to obtain the data that most accurately measure existing and potential environmental contamination at the Dead Creek sites, for use in the HRS and/or Health Advisory mechanism. E & E obviously cannot guarantee that the levels of contamination or impacts will be adequate to justify placement of the sites on the NPL or SRAPL. However, in the event that neither mechanism achieves this objective, the data collected will provide a substantial data base for IEPA legal channel use in seeking responsible-party monies for remediation or seeking alternative NPL or SRAPL mechanisms.

The HRS mechanism approach is described in Section 3.1. This mechanism is the most common and routine way to place a site or sites on the NPL and/or SRAPL. E & E will concentrate on gathering the data necessary to achieve the highest justifiable HRS score for individual Dead Creek sites and groups of sites. Specifically, the scope of work will be directed toward documenting any releases of contaminants to the air for use in the air route score portion of the HRS model; documenting target populations and waste characteristics for use in the model's groundwater, surface water, and air route score portions; and documenting a common waste, ownership, or operator relationship at the sites (for site grouping purposes).

If the HRS mechanism fails to place the sites on the NPL and/or SRAPL, E & E will proceed to the Health Advisory mechanism, described in Section 3.2. Specifically, based on a review of the data and contact with USEPA and ATSDR personnel, E & E has concluded that acquisition of NPL listing using the H/A route will depend on showing either:

- A complete exposure pathway, linking the contaminants from Dead Creek sites to human exposure and involving significant health risks to humans; or

- A significant threat of a complete exposure pathway that involves significant risks to humans.

In order to facilitate such a demonstration, E & E proposes to conduct:

- A geohydrologic study to demonstrate significant off-site transport of hazardous chemicals to Dead Creek and the Mississippi River.
- Sediment sampling in Dead Creek to characterize and demonstrate a potential exposure pathway for persons near the site.
- Seep sampling to demonstrate the direct release of contaminants from the two sites nearest the river (Sites Q and R).
- Sampling of Mississippi River sediments to document a human exposure pathway involving ingestion of fish contaminated with highly persistent, low- water-soluble, highly toxic chemicals: three heavy metals (mercury, lead, and cadmium) and persistent toxic organics (dioxins, dibenzofurans, PCBs, and methyl mercury). These substances were chosen because they are the most highly bioaccumulative of the substances likely to be found at the Dead Creek sites.
- A fish study to document the bioaccumulation of the above-listed, highly toxic substances at concentrations above limits in fish that can be caught for human consumption. Because the selected substances have high bio-concentration factors (BCFs), the fish study represents the optimal way to demonstrate potential human risk.

3.1 HRS MECHANISM

The HRS mechanism approach is designed specifically to address the possibilities for maximizing the HRS scores for the Dead Creek sites. HRS scores previously have been developed for two site areas: Site R and Dead Creek, which includes Sites G and L (see Figure 3-1).

The most recent HRS submissions to USEPA included scores of 7.23 and 29.23 for Site R and Dead Creek, respectively. The score for Site R was low due to the lack of both a documented air release and a target population for the groundwater and surface water routes. On the other hand, although the HRS score for Dead Creek, as submitted, was sufficient to qualify the site for the NPL, several parameters used in the score did not meet USEPA quality control (QC) requirements and USEPA downgraded the score. Specifically, the observed release for the air route, based on screening of the creekbed with an organic vapor analyzer (OVA), was unacceptable because more substantial evidence of contaminant migration is needed for documentation of an observed air release; and the waste quantity values assigned in the score were unacceptable because contaminated soils were included as reported wastes.

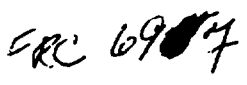
In preparing this proposal, E & E has developed preliminary HRS scores for the Dead Creek sites. Based on a review of available data and this preliminary HRS scoring, the key elements for data acquisition necessary to maximize the HRS scores have been identified. These elements cover all possibilities for increasing the previously submitted HRS scores and will provide a definite determination of whether the HRS mechanism for NPL qualification will be applicable. The key elements include a strategy for site aggregation, a water supply search, air monitoring, and further field investigations to provide site-specific waste profiles.

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Proposed Project Areas for HRS Scoring 	

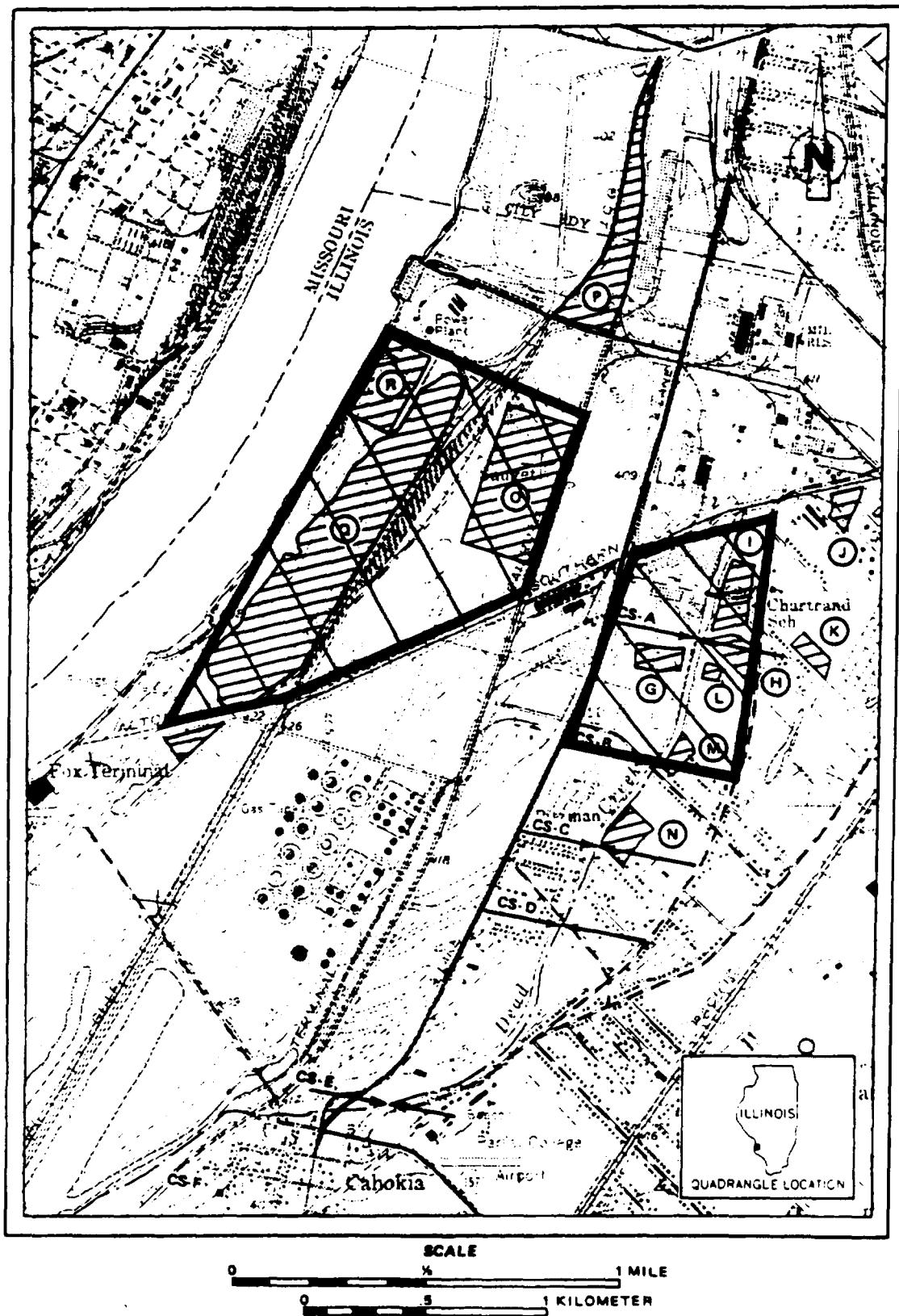


Figure 3-1 PROPOSED PROJECT AREAS FOR HRS SCORING

Site Aggregation

E & E proposes to direct its efforts toward developing HRS scores for two separate areas within the project area, rather than toward scoring each individual site. This approach is similar to that taken in the most recent State HRS submission for Dead Creek. Specifically, E & E proposes to develop HRS scores for Dead Creek (with the adjacent Sites G, H, I, L, and M); and the Mississippi River area (including Sites O, Q, and R).

Site aggregation is a valid approach for maximizing the HRS scores, provided that the USEPA criteria for doing so are met. While USEPA is developing further guidelines for grouping sites to be scored, the requirements now in effect are as follows:

- The sites must be geographically related--i.e., the target populations for sites being grouped must be the same or substantially overlap; and
- The sites must have been operated as parts of a single unit--i.e., if similar ownership or operators of separate sites can be shown, such sites may be grouped as one (for example, historical aerial photographs indicate the Sites H and I were operated contiguously and subsequently were separated by the construction of Queeny Avenue); or
- Contamination from the sites must be threatening the same media--i.e., exposure routes must be similar for all of the sites to be aggregated.

With these requirements in mind, it will be necessary to conduct a historical search of the tax records for the Dead Creek area, in order to determine common ownership or operators.

Although noncontiguous sites will be aggregated for HRS scoring purposes, this does not eliminate the need to develop site-specific data. The approach described herein is designed to account for all of the USEPA quality assurance (QA) requirements for HRS scoring, while still providing valid and useful data for further investigation toward use of other NPL/SRAPL mechanisms (Health Advisory) to toward negotiation or litigation with responsible parties in the event that the HRS

rescoring is unsuccessful in raising the HRS score to the level necessary for NPL/SRAPL placement.

Water Supply Search

Previous HRS scores submitted for Site R (the Sauget Toxic Dump) and Dead Creek showed a lack of target populations for the groundwater and surface water routes. Documentation records for these submissions indicated that an intake in the Mississippi River, upstream from the sites, supplies drinking water for the entire population within three miles. A review of records for another site in the Sauget (Moss American) area showed that a small number of residents use private wells as a drinking-water source. In addition, a groundwater resource publication prepared by the Southwestern Illinois Metropolitan and Regional Planning Commission indicates that up to 69 area households use groundwater as a drinking-water source.

Although these references were used as documentation for the Moss American HRS score, E & E believes that more specific information may maximize the score and also will be needed to meet USEPA QC requirements. It is possible that a larger population uses private supplies for drinking water. In addition, the industrial and irrigational uses of groundwater in the area have not been clearly defined. As a result, E & E proposes to conduct a water supply search to more clearly delineate the public, private, industrial, and irrigational uses of groundwater and surface water in the project area and to define the distribution of public water supplies. This will include reviewing files of the:

- Local water departments,
- Illinois American Water Company,
- Illinois Department of Public Health (Edwardsville),
- Illinois State Water Survey,
- United States Army Corps of Engineers,

- University of Illinois Agricultural Extension Service,
- IEPA, and
- USEPA.

Telephone interviews with private parties and industries also will be conducted as necessary. All water supply distribution lines, surface water intakes, and active drinking-water and irrigation wells will be mapped to provide documentation for HRS scoring purposes. In the process, a catalog of contacts and information gathered will be developed.

Air Monitoring

A review of the previous HRS scoring efforts indicated several possibilities for increasing the scores for Site R and Dead Creek. The most important of these possibilities--and the only one applicable to qualifying the Dead Creek sites for the NPL--involves showing an observed release for the air route.

Air monitoring has been conducted at Dead Creek on two previous occasions. In 1980, IEPA collected air samples from the creekbed using charcoal tubes, but limited organic analysis of these samples was inconclusive (one sample showed a detectable concentration of benzene, but all other samples were below detection limits for the compounds analyzed). In 1982, as part of a site investigation, the USEPA field investigation team contractor (E & E) gathered additional air monitoring data at Dead Creek using a photoionization detector, OVA, and Draeger tubes. Although both the photoionization detector and the OVA detected fairly high levels of volatile organics (200 to 300 parts per million) near the surface of the creekbed, these measurements do not meet current HRS QA requirements.

Neither preliminary screening for volatile organics (using a photoionization detector or OVA), nor in-field gas chromatograph (GC) screening for low to semivolatile organic compounds, will cover all of

the possibilities for showing an air release, because these methods do not address airborne particulates and the potential for contaminants to migrate from a site via this route.

USEPA QC requirements for scoring an air release are very stringent. Air monitoring with a photoionization detector or OVA no longer is acceptable, and significant air contamination must be shown at distances removed from sources such as leachate pools and contaminated soil. As a result, a detailed and specific approach is needed to show an air release at the Dead Creek sites.

E & E has developed a two-phased approach designed to satisfy all QC requirements for HRS scoring and cost-effectively provide source identification and quantified data concerning the nature and extent of air contamination in the study area. Phase 1 will consist of monitoring "worst-case" Dead Creek sites; Phase 2 will consist of any additional site-specific monitoring necessary to meet the HRS requirements. The investigative technique will be the same for each phase, with the initial survey being conducted at Sites G, Q, R, and Dead Creek.

The investigation will consist of recording meteorological data, such as wind speed and direction; and collecting air samples with a high-volume sampler equipped with a particulate filter, polyurethane foam (PUF) cartridge, and charcoal filter (or other sorbent material) assembled in series. Stations will be located at a minimum of one upwind background location, plus three to five suitable downwind locations. One duplicate station also will be situated in a downwind location.

A total of 138 air samples, including 30 field QC samples, will be collected during the initial survey (see Table 3-1). At each monitoring station, samples will be collected at 12-hour intervals over a three-day period. Three samples will be collected per station, resulting in 54 air samples plus nine duplicate samples for each survey area (Site G/Dead Creek and Sites Q/R). The remaining 12 samples will consist of field blanks and spikes for QC purposes.

Table 3-1

**COMPARISON OF SAMPLING ANALYSES:
ORIGINAL AND REVISED SCOPES OF WORK**

Media	Site	Original Scope	Revised Scope	Difference
Air*	G/B	0	54	
	Q/R	0	54	
	Field QC	0	30	+138
Surface soil	G	40	40	
	H	5	0	
	I	32	0	
	J	5	2	
	N	3	0	
	Field QC	15	6	
	To be determined (Dioxin)	10	0	-62
Subsurface soil	G	10	10	
	H	5	10	
	I	15	15	
	L	4	4	
	O	0	10	
	J	5	3	
	K	3	3	
	N	2	2	
	P	0	3	
	Field QC	12	15	+19
Surface Water/Sediment	A	3	2/6†	
	B	3	2/6†	
	C	2/2	2/6†	
	D	1/2	2/6†	
	E	3/10	§	
	F	4/10	§	
	H	2/3	2/3	
	Field QC	5/6	3/6†	-10/0
Groundwater	Existing monitoring wells (IEPA)	12	12	
	Residential wells	5	5	
	New monitoring wells	20		
	G		2	
	H		4	
	I		6	
	O		5	
	Q		8	
	Existing monitoring wells (Monsanto) at R		6	
	Field QC for wells	8	10	+13
Total samples				
Soil/sediment		199	146	
Water		68	71	
Air			138	
TOTAL				+88

*Phase 1 only.

†Postpone pending results of revised scope-of-work investigations.

③ Each sector and field QC includes two samples to be analyzed for dioxin and dibenzofurans.

The Phase 2 air monitoring will require a similar number of samples to be collected in areas not initially surveyed. If Phase 2 is necessary, specific locations will be determined based on a review of the data from the Phase 1 investigation.

The samples will be shipped to E & E's Analytical Services Center for screening and/or analysis. At the laboratory, the particulate filters will be analyzed for metals and low and semivolatile organic compounds; PUF cartridges and charcoal filters will be analyzed for organic compounds.

E & E believes that the Phase 1 monitoring of the sites will have the greatest potential for detecting an air release. Accordingly, the most cost-effective course of action will be to implement Phase 2 only if needed to meet HRS requirements. Following receipt of the Phase 1 results, E & E will determine whether additional Phase 2 investigation is necessary. However, it must be noted that the occurrence of an observed release of airborne contaminants at the Dead Creek sites cannot be guaranteed by any method.

Further Field Investigations

While a water supply search and air monitoring are important factors to increase the HRS scores for the sites, the field investigations proposed in the original IEPA RFP are equally important to the entire project. These investigations will provide data to determine the impact of each site on the environment and will identify the source(s) of contamination previously observed in the area. In addition, the field activities will provide support data for the HRS scoring and may enable an increase in the waste quantity score for the Dead Creek area.

The goal of the field investigations is to define the extent of contamination in the area and to determine the extent to which the contamination may affect public health and the environment. The proposed

revisions to the existing scope of work are intended to provide the best possible data to meet these objectives. For example, E & E believes that surface soil sampling at Dead Creek sites other than Sites G and J would not be effective, since most of the areas are covered subsurface disposal areas. In addition, the effort needed for creek sampling from Sectors E and F should be redirected to provide additional data for higher-priority sites. Field investigations at sites where it is felt that HRS scoring would not be fruitful--specifically Sites J, K, N, and P--should be limited at this time to preliminary sampling intended to provide a characterization of the wastes present. Following a review of data derived from the preliminary sampling, E & E will recommend whether further investigation is warranted, or whether the sites J, K, N, and P should be dropped from the project. If IEPA determines that additional investigations are warranted, the scope of work and project costs will be modified at that time.

The additional field investigations will consist of collecting samples from the various media at the Dead Creek sites. Surface soils, subsurface soils, surface water and sediment, and groundwater will be sampled. Although each Dead Creek-area site will be approached separately, a comparative analysis will be performed to determine the interrelationships between matrices and sites. In order to reduce the number of samples that require detailed quantitative analysis, samples will be screened as outlined in the original proposal.

Surface Soil Sampling. As shown in Table 3-1, surface soil samples will be collected only at Sites G and J, because E & E believes that surface sampling at the other Dead Creek sites would not provide valuable data and the sampling efforts should be redirected to other areas and media.

Surface soil sampling at Site G will be conducted as proposed in E & E's response to the initial RFP. Samples will be collected at 50-foot intervals, resulting in 74 sampling points (grid sections). A minimum of three subsamples will be collected from each grid section

with a coring tool; these samples then will be composited. Based on the results of field-screening procedures, 40 samples will be selected for laboratory analysis at E & E's Analytical Services Center.

In order to characterize the wastes present, two surface soil samples will be collected from Site J at random locations: one from the surface disposal area, and the other from a location near the pit in the southeast corner of the site. A preliminary investigation at Site J has shown uniform wastes (casting sand, slag) over the entire site. The two surface samples will provide an adequate characterization of this material.

Subsurface Soil Investigations. Subsurface soil samples will be collected at Sites G, H, I, L, and, O; as well as Sites J, K, N, and P. Samples will be composited as described in the previously submitted work plan. As listed in Table 3-1, a total of 75 subsurface soil samples, including field QC samples, will be collected for laboratory analysis.

The summary of subsurface sampling to be accomplished at each of the five sites involved in HRS scoring efforts is as follows:

- **Site G.** Ten composite subsurface samples will be collected. Up to eight borings will be drilled to a maximum depth of 20 feet each. The resultant data will provide an indication of the lateral and vertical extent of contamination at the site, and also may facilitate waste quantity calculations for HRS scoring.
- **Site H.** To provide adequate site coverage for waste quantity characterization, 10 composite subsurface samples will be collected. Borings will be drilled to a maximum depth of 50 feet each at up to eight locations. Data will be incorporated into the HRS scoring and further investigations.
- **Site I.** Fifteen composite subsurface samples will be collected from up to nine borings having a maximum depth of 40 feet each.
- **Site L.** Four composite subsurface soil samples will be collected. Four borings will be drilled to a maximum

depth of 20 feet around the location of the former surface impoundment.

- **Site O.** Originally, no field investigations were proposed for Site O. A review of available background information has indicated that this site has significant data gaps and that further investigation is necessary to determine the impact of Site O on public health and the environment. Ten composite subsurface soil samples will be collected in the area of the former sludge lagoons. Eight borings will be drilled to a maximum depth of 20 feet each. The borings will be drilled across the lagoon area in order to characterize wastes present and provide specific information concerning contaminant distribution. The data developed from this sampling will be used for HRS scoring purposes and to identify preliminary remedial alternatives.

These subsurface investigations will focus on supplying data to support HRS scoring efforts, while still providing valid and usable information should further investigation be necessary.

For the remaining sites (J, K, N, and P), E & E believes that the best approach is to conduct an initial waste characterization, followed by a determination of whether further investigation is needed. HRS scoring is not likely to be productive for these sites, since USEPA site aggregation policy prohibits them from being grouped with the other sites in the project area. Since sites J, K, N, and P are, for the most part, subsurface disposal areas, the preliminary waste characterization will be accomplished by conducting geophysical investigations (magnetometer surveys) and subsurface sampling at each site. The magnetometer surveys will be used to determine any possible drum burial areas, for use in the strategic location of borings. Soil samples obtained from the borings will be screened in the field in order to minimize the number of samples that require detailed quantitative analysis in the laboratory.

In summary, the subsurface sampling to be conducted for HRS scoring purposes is as follows:

- **Site J.** Three composite subsurface soil samples will be collected. The three borings will be drilled to a maximum depth of 20 feet each.
- **Site K.** Three composite samples from three borings (drilled to a maximum depth of 20 feet each) will be collected.
- **Site N.** Two composite subsurface soil samples will be collected. The two borings will be drilled to a maximum depth of 40 feet each. Historical aerial photographs suggest placement of the borings in the southeast and northwest portions of the filled area, respectively.
- **Site P.** Although monitoring-well installation and groundwater sampling originally were proposed for Site P, E & E now believes that waste characterization would be better accomplished by the collection of three subsurface soil samples. Up to six borings will be drilled to a maximum depth of 40 feet and three composited subsurface soil samples will be collected. The compositing of samples across borings will be the most cost-efficient means to determine the presence of any contamination.

Surface Water/Sediment Sampling. Surface water and sediment samples will be collected from and Creek Sectors A, B, C, and D; plus Site M. Originally scheduled sampling in Creek Sectors E and F will be postponed, pending review of data for the other creek sectors. As a result, sampling of Creek Sectors E and F is not included in E & E's proposed cost for the HRS mechanism. If such sampling is found to be needed, the HRS mechanism cost will be adjusted accordingly for IEPA approval. (It should be noted that, if the Health Advisory mechanism work is found to be necessary, sampling of Creek Sectors E and F--assuming such sampling is not required for the HRS--is proposed and is part of E & E's estimated cost for that work).

As listed in Table 3-1, for each Creek Sectors A through D, E & E will collect two composite water samples from upstream and downstream locations; and four composite sediment samples, including sediment samples from two separate depth intervals upstream and downstream. If specific discharge points (e.g., leachate seeps, effluent pipes) are observed, samples also will be collected in the discharge areas(s). In addition, two sediment samples will be collected from each Creek

Sector A, B, C, and D, for analysis for dioxins and dibenzofurans. The dioxin/dibenzofuran sampling and analysis is incorporated here because of the potential presence of these substances and the value of the analysis to waste characterization, as well as because such analysis during the HRS work will minimize duplication of sampling if Health Advisory investigations are required.

Two surface water and three sediment samples will be collected from Site M. Composite water samples will be collected using a Kemmerer sampler or a negative/positive pressure sampling device. One sample will be taken in the southwest corner of Site M near the cut-through to Dead Creek; the second will be collected in the northeast portion of the pl. Three random, composite sediment samples will be collected from the northwest, southwest, and east-central portions of the site, respectively.

Groundwater Sampling. The original scope of work for this project calls for the collection of groundwater samples from 12 existing IEPA monitoring wells; five residential wells; and 20 new monitoring wells (to be installed at Sites P, Q, and R). A review of the available background data has indicated the need for several modifications since, in order to aggregate sites for the HRS scoring, specific groundwater data will be needed for each site. Monitoring wells must be placed up- and downgradient from each site in order to determine the effects from the sites on area groundwater. The revised scope of work entails an increase in the number of wells to be installed/samples to be collected (see Table 3-1).

Groundwater samples will be collected from the 12 existing IEPA monitoring wells; five residential wells (if appropriate); 25 new monitoring wells (to be installed); and six existing monitoring wells at Site R, installed for Monsanto by Geraghty and Miller, Inc.

- **Existing IEPA Monitoring Wells.** A preliminary reconnaissance of the Dead Creek area has indicated that only eight of the original 12 IEPA monitoring wells remain.

Of the eight wells located, two have casings broken off below the ground surface and all are constructed with glue-joint polyvinyl chloride (PVC) casing and hacksaw-slotted PVC screens. An attempt will be made to reconstruct the existing IEPA wells by pulling the casings and replacing them with stainless screens and risers. If the existing casings cannot be removed without drilling, the wells will be overdrilled or new wells will be installed adjacent to the existing wells. E & E anticipates that the drilling of new wells adjacent to the existing wells is the most likely scenario, and has used this scenario in its preparation of the estimated project costs. The reconstructed or newly installed wells then will be developed and sampled according to the procedures described in the previously submitted work plan.

- **Residential Wells.** Groundwater samples will be collected from five private wells in the Dead Creek area. An attempt will be made to sample the same wells that were sampled in the IEPA preliminary hydrogeologic investigation of 1980 and 1981. Sampling procedures will be as described in the work plan.
- **New Monitoring Wells.** Due to the USEPA requirements for grouping noncontiguous sites for HRS scoring, it will be necessary to develop site-specific groundwater data prior to rescoring. E & E proposes that 25 new monitoring wells be installed: five more than specified in the original scope of work. I.e., in addition to the 20 new wells to be installed per the original scope of work, E & E proposes to install new wells at several of the sites to be rescored: Sites G, H, I, O, and Q.
 - **Site G.** Two new monitoring wells will be installed to augment the existing wells at this site. Three existing IEPA wells are located in appropriate spots to monitor Site G, although one well (G106) could not be located. The two new wells will be installed in locations that the existing wells are not situated to monitor. Specifically, one well will be installed along the west perimeter of the site; the second will be located in the northern portion of the site. A total of five groundwater samples will be collected from Site G.
 - **Site H.** Four groundwater samples will be collected at Site H from new monitoring wells. One background well will be located east of the site; three additional wells will be placed in suitable downgradient locations to be determined in the field.
 - **Site I.** Six groundwater samples will be collected at Site I from new monitoring wells. One downgradient

IEPA well (G112) could not be located and is suspected to have been abandoned. One new well will be located in a background area east of the site; the remaining five wells will be placed in downgradient monitoring locations.

- Site O. Although no field investigations originally were scheduled for this site, a review of available fill information indicates that investigation is warranted. One background well will be placed east of the site and four wells will be located in suitable downgradient areas. Five groundwater samples will be collected.
- Site Q. Eight groundwater samples will be collected from new monitoring wells that will be situated to provide the best possible monitoring coverage of the entire Site Q. Due to the size of the site (100+ acres), wells will be located in areas where previous reports have indicated problems.
- Existing Monsanto Monitoring Wells. Because a substantial number of wells presently are in-place at Site R, additional well installation is not necessary. The existing wells (installed for Monsanto) will be inspected to determine their integrity prior to sampling. A total of six groundwater samples will be collected at Site R from these wells.

In addition to the sampling approach described above, soil gas monitoring and infiltration testing will be conducted as outlined in the previously submitted work plan.

The proposed revisions and additions to the scope of work also will necessitate modification of the work plan and QAPP. Such modifications will be completed, as appropriate, prior to initiation of the field investigations.

Project Report

Following completion of the field investigations, a project report will be prepared. The final report will consist of the following major elements:

- Introduction and Executive Summary (project overview);
- Project Description (general details of specific tasks);
- Project Area History and Background (findings of all background investigations completed during the project, consisting largely of the Current Situation Report [Task 5]);
- Field Investigation Description and Results (thorough description of all field investigation work and the data and results obtained from those investigations);
- Findings and Analysis of Field Investigations (qualitative and quantitative description of the extent of contamination identified in the study area);
- Exposure (Risk) Assessment (evaluation of the risk to life forms resulting from the release of identified contaminants from the Dead Creek sites); and
- Investigation Conclusions (site-by-site discussions of findings, including an analysis of investigation results as they relate to preliminary remedial technologies that have been identified as applicable to the sites).

The report will contain all supplemental data gathered during the study which can be utilized by IEPA to prepare revised HRS scores for the project-area sites.

A draft copy of this report will be submitted to IEPA for comment. A final report then will be prepared, incorporating changes identified during the comment period, for submission to IEPA.

3.2 HEALTH ADVISORY MECHANISM

Background

Section 300.66(b)(4) of the National Oil and Hazardous Substances Contingency Plan (NCP) was amended on September 16, 1985, to allow some sites that do not score 28.5 or greater on the HRS to be added to the NPL. According to Paragraph (b)(1) of Section 300.65 of the NCP, a lead agency, upon determination that there is a threat to public health and welfare or the environment, may take necessary action to abate, minimize, stabilize, mitigate, or eliminate a release, or threat of release, or threat resulting from that release or threat of release. This is the basis for the Health Advisory (H/A) mechanism for NPL listing.

USEPA may initiate the H/A procedure if all three of the following criteria are met:

- The Agency for Toxic Substances and Disease Registry (ATSDR) of the United States Department of Health and Human Services has issued a health advisory (H/A) recommending the dissociation of individuals from the release;
- USEPA determines that the release poses a significant threat to public health; and
- USEPA anticipates that remedial response will be more cost-effective than removal response.

Currently, out of more than 200 sites for which some form of health assessments have been conducted as part of the H/A procedure, one site (Landsdowne, Pennsylvania; radiation exposure) has been listed on the NPL based on the H/A mechanism. Another site (Quail Run Manor Park, Missouri, dioxin exposure) is a strong candidate for such listing.

According to E & E's USEPA contacts, state or local health department health assessments usually precede the ATSDR issuance of an H/A. Therefore, while ATSDR usually is involved in an H/A at the insistence of a regional USEPA office, the local or state agency usually initiates the H/A mechanism process by providing the recommendation for listing, documentation, and presentation of findings to the regional USEPA office.

USEPA believes that, in order to assure national consistency in implementing NCP Section 300.66(b)(4), public health advisories issued by state departments of health cannot be used in lieu of public advisories issued by ATSDR to invoke the H/A listing mechanism. States can, however, recommend to ATSDR that an H/A be issued.

According to E & E contacts with ATSDR personnel, ATSDR typically functions in a supervisory capacity, overseeing data collection by local or state agencies and evaluating the data to maintain appropriate QA/QC. Therefore, although ATSDR has the authority and capability to take the lead in data collection and evaluation, typically research and conclusions achieved by state or local departments of health are used to establish the presence and concentrations of substances, their migration, and health effects; and documentation of exposure pathways and the number of people exposed.

Unless ATSDR finds sufficient cause to recommend issuance of an H/A with recommendation for dissociation of the population from the project-area sites, NPL listing via the H/A route cannot be effected. One ATSDR source has indicated to E & E that this determination, from submission of suitable data, takes at least one month. This contact further indicated that specific interim H/A guidance was not available for H/A purposes.

Representatives of both USEPA and ATSDR have indicated their respective agencies' desire not to be limited prematurely to the artificial adoption of standards pertinent to the NCP Section 300.66 listing. The approach intentionally taken has been to adopt a "case-by-case"

approach utilizing existing and recognized standards. (See 50 FR 37626 of September 16, 1985, Paragraph V, comments concerning the lack of health advisory standards.) Moreover, such case-by-case review does not obviate the mandatory requirement for meeting the three criteria outlined on page 3-20 of this discussion.

Rationale for Pursuing the H/A Mechanism for Dead Creek Sites

In order to optimize the chances for listing the Dead Creek sites on the NPL via the H/A mechanism, a complete exposure pathway showing a potential significant adverse health risk to humans--or the threat of such a pathway and risk--must be demonstrated. In the absence of such a demonstration, USEPA has indicated that it does not believe that gross contamination of the Mississippi River, by itself, is sufficient to qualify a site for the NPL via the H/A mechanism.

Although USEPA's overriding viewpoint is that only in a few "certain limited circumstances" would a site not otherwise attaining sufficient HRS scores be able to be listed via the H/A mechanism, if the revised scope of work described in Section 3.1 of this proposal for the HRS mechanism fails to qualify the Dead Creek sites for NPL and/or SRAPL listing, pursuance of the H/A mechanism would be worthwhile for two main reasons:

- All current data suggest the presence of large amounts of hazardous substances that have significant potential for--or already have the confirmed existence of--a release. With these conditions, there appears to be a fair chance that a thorough evaluation would produce data that would substantiate the need to list the sites via the H/A mechanism.
- The courts are likely to require that all administrative avenues be exhausted prior to seeking legal recourse. Accordingly, even if the H/A mechanism is not undertaken, any further court action or attempts to pursue other mechanisms for NPL and/or SRAPL listing probably would require the collection of the data necessary for pursuance of the H/A mechanism prior to the initiation of other actions.

E & E believes that the H/A mechanism scope of work proposed herein will provide a sufficient data base to enable ATSDR to make a decision regarding issuance of an H/A for the Dead Creek sites. The goal of the work will be to document the need for an ATSDR recommendation for dissociation of the population from the sites, because the sites pose significant risk to human health and the environment.

Based on its review of information already collected for the sites, E & E proposes a scope of work to document the need for an H/A. Through its contacts with ATSDR, USEPA, and its corporate Health and Safety Advisory Committee, E & E has determined that the need for an H/A can best be documented through a demonstration of direct contact of contaminants from the sites with the public. Direct contact with contaminants for the Dead Creek sites can occur through four possible routes of exposure:

- Consumption of contaminated fish;
- Consumption of contaminated water (groundwater and surface water);
- Direct dermal exposure with contaminated water, sediments, or soils; and
- Direct inhalation of contaminants.

To demonstrate direct contact with contaminants via one of these routes, it is essential to:

- Document that contaminants are present at the sites and the quantity present;
- Document that contaminants are being released and the quantities of the releases; and
- Document the continuous route of contaminants from the site to the receptor population.

Accordingly, the scope of work proposed by E & E will focus on documenting the direct linkage of contaminants present at the Dead Creek sites with a receptor population via one of the four routes of exposure. Since the direct inhalation route and the consumption of

contaminated groundwater route will be examined carefully under the HRS mechanism scope of work, no fieldwork related to either of these routes is planned under the H/A scope of work, although these routes will be examined under H/A data interpretation task. Instead, the H/A fieldwork will concentrate on the fish consumption, surface water consumption, and direct dermal exposure routes by documenting the presence of contaminants at the sites, the release of contaminants, and continuous pathways to the receptor population.

As mentioned previously, the substances targeted for investigation related to the H/A mechanism include three heavy metals (mercury, lead, and cadmium) and persistent toxic organics (dioxins, dibenzofurans, PCBs, and methyl mercury). These substances have been selected because they are most highly persistent, low-water-soluble, and/or bioaccumulative of the substances likely to be found at the Dead Creek sites.

Data obtained from previous investigations of the project-area sites, including the field investigations conducted for the HRS mechanism scope of work, will provide the necessary documentation concerning the presence and quantity of target contaminants at the sites. Existing data documenting the release of target contaminants will be supplemented by H/A mechanism field investigations of leachate seeps from Sites R and Q and groundwater contaminant concentrations at Site R. Existing documentation of continuous routes from the sites to a receptor population will be supplemented by H/A mechanism field investigations of geohydrology, sediments in downstream sectors of Dead Creek, sediments of the Mississippi River, and bioaccumulated contaminants present in fish in the Mississippi River. The geohydrologic and sediment sampling fieldwork is designed to provide documentation of the transport of contaminants via groundwater and surface water to the Mississippi River. The geohydrologic fieldwork will provide the documentation needed to examine the following three transport scenarios for H/A consideration:

1. The current scenario entails direct transport of contamination from Sites Q and R via groundwater to the Mississippi River; plus contaminant transport to Dead Creek that directly results in human exposure and/or transport of the contaminants via the creek to the Mississippi River.
2. The intermediate-term scenario involves cessation of groundwater pumping which, based on historical records, creates a rise of the water table to within a few feet of the ground surface at Sites Q and R. With such elevated water levels, contaminants in the upper portions of the site soil will be transported at increased rates to the Mississippi River. Moreover, drums of hazardous waste buried on-site will rupture or disintegrate when covered by water, resulting in a substantially increased contaminant volume and transport rate--thereby posing the threat of transport of a significant volume or "slug" of contaminants to the river.
3. The long-term scenario involves the periodic flooding of Sites Q and R, which has occurred as recently as 1973 and would result in the release of large quantities of site contaminants directly to the Mississippi River. As is the case for the intermediate-term scenario, buried on-site drums, when covered with water, may rupture--resulting in the transport of a significant "slug" of contamination to the river.

The sediment sampling of the Mississippi River and examination of contaminants present in fish caught upstream and downstream from the Dead Creek sites is designed to provide documentation of the linkage between released contaminants and direct human contact via consumption of contaminated fish. The sediment and seep sampling also is designed to provide supplemental documentation of the linkage between release contaminants and direct human contact via dermal exposure.

Table 3-2 lists the five tasks, with subtasks, that E & E anticipates will be necessary for the proposed H/A mechanism scope of work. The remainder of this section describes each task in more detail.

The H/A mechanism sampling tasks are closely related to--and dependent upon--the results of the HRS mechanism sampling activities. To maximize the use of the data and avoid duplication of effort, the proposed H/A activities will be scrutinized closely at the conclusion

Table 3-2

H/A MECHANISM SCOPE OF WORK

Task 1: Geohydrologic Study

- A.** Install and sample two nests of 3 monitoring wells each at Site R: 1 between the Mississippi River and the site and 1 between the site and the railroad to the east. Analyze the samples for heavy metals (mercury, lead, and cadmium) and persistent organics (PCBs, dioxins, and dibenzofurans). Perform permeability tests on Shelby tube samples.
- B.** Install one recording gauge on the Mississippi River, and another on one of the monitoring wells, to document the relationship between surface water levels and groundwater levels. Measure groundwater levels in the the other monitoring wells.

Task 2: Sediment Sampling

Sample sediments at 4 locations within Creek Sectors E and F. Analyze the samples for mercury, lead, and cadmium and PCBs, dioxins, and dibenzofurans.

Task 3: Seep Sampling

Identify and sample seeps alongside Sites Q and R on the bank of the Mississippi River at low water stage. Sample six seeps, if possible, and analyze the soil and water samples for heavy metals (mercury, lead, and cadmium) and PCBs, dioxins, and dibenzofurans.

Task 4: Fish and Sediment Survey

- A.** Design survey based on a study of background data concerning fish and sediment types/occurrence and the existence/applicability of any previous surveys.
- B.** Collect fish and sediment samples from locations upstream and downstream from Sauget. Analyze the samples for heavy metals (mercury, lead, and cadmium) and persistent organics (PCBs, dioxins, and dibenzofurans).

Task 5: Data Interpretation

Interpret the data collected during Tasks 1 through 4 and all previous investigations to document environmental impacts that have occurred as a result of migration of contaminants from the Dead Creek sites. Delineate the population at risk and potential health effects.

of the HRS mechanism work. At that time, E & E will modify and finalize the H/A mechanism outline proposed herein and provide an updated schedule and cost estimate for IEPA approval.

Task 1: Geohydrologic Study

A geohydrologic study will be conducted to provide the data needed to document current conditions and to permit the characterization of intermediate-term and flooding conditions.

Subtask 1A. A total of six monitoring wells are recommended for installation at Site R. This geohydrologic investigation is designed to supplement the results of the HRS mechanism geohydrologic work proposed in Section 3.1. In that section, E & E proposes to sample the existing wells at Site R. Based on the results of that work, E & E will select the exact locations and depths for the six new wells tentatively proposed for the H/A study. E & E anticipates that these wells will be grouped into two well nests, each consisting of a deep, intermediate, and shallow monitoring well. One well nest will be located on the bank of the Mississippi River between Site R and the river; the other will be located approximately 1,500 feet to the east, between Site R and the levee and railroad. Shelby tube samples will be collected at both locations and permeability analyses will be run of the samples. The drilling, development, installation, sampling, and decontamination procedures will follow the project work plan.

Groundwater sampling will be conducted in the six monitoring wells, after the wells have been thoroughly developed. The groundwater samples will be analyzed at the following laboratories for the following parameters:

- E & E's Analytical Services Center: PCBs
Mercury
Lead
Cadmium
Methyl mercury
- Another IEPA-approved laboratory: Dibenzofurans
Dioxins

Subtask 1B. With IEPA assistance in obtaining site access, an approximately 20-foot length of factory-cut PVC wellscreen will be installed on a jetty or dock at or close to Site R. A Leopold and Stevens Model F water level recorder (or equivalent) will be installed to continuously measure fluctuations in river level. A similar instrument will be installed on the intermediate well in the well cluster located to the east of Site R. Charts will be collected monthly for three months. The other monitoring wells will be measured at the time of changing charts to determine horizontal and vertical hydraulic gradients at different levels within the ground.

Task 2: Sediment Sampling

If the HRS mechanism fieldwork confirms the presence of contaminants in the sediments of Creek Sections A, B, C, and D, E & E proposes to collect additional sediment samples in Dead Creek to document whether the creek poses a direct threat to human health and the degree to which transport via the creek results in contamination of the Mississippi River.

Four composite samples of fine-grained sediment will be collected from Dead Creek. They will be taken from the upstream ends and mid-points of each of the Creek Sections E and F.

Sediment sampling under the HRS mechanism scope of work was expanded to include sampling and analysis for dioxin and dibenzofurans, in order to avoid the duplication of sampling programs for Creek Sectors A, B, C, and D.

Task 3: Seep Sampling

E & E proposes to collect seep samples to document a release to the river and provide a link in the exposure pathway, attempting to document contamination of fish.

During the river's low water stage, E & E will attempt to identify up to six seeps which discharge directly into the Mississippi in the areas of Sites R and Q. Soil/sediment and water samples will be obtained, for analysis for heavy metals (mercury, lead, and cadmium) and persistent toxic organics (PCBs, dioxins, and dibenzofurans).

Task 4: Fish and Sediment Survey

E & E proposes to document a complete exposure pathway by investigating the final two links: sediment contamination and fish contamination by highly bioaccumulative chemicals (e.g., dioxins, dibenzofurans, PCBs, and methyl mercury) that are likely to be transported from the sites to the river and are most likely to be found at concentrations above detectable levels in fish.

Subtask 4A. E & E will contact various state and federal agencies to obtain the data necessary to establish the potentially affected population and to determine whether any previous investigations have been conducted to evaluate dioxins, dibenzofurans, heavy metals, and PCBs in project-area fish tissue and sediments. Information from these efforts will include data concerning licensed fishermen (recreational and commercial if applicable) and the results of any surveys of angler effort days and vessel use days. In addition, the fish divisions of the Illinois and Missouri departments of environmental conservation will be contacted for information concerning any creel surveys, fisheries landing data, and fish population dynamics.

Coincidental with the agency contacts, E & E will develop a comprehensive work plan specifying the detailed collection and processing protocol for fish tissue and sediment sampling. This task will be important since dioxins and dibenzofurans usually are present at extremely low levels (0.05 parts per billion [ppb] or less). As a result, great care will be taken in the sample collection, handling, and processing to prevent cross contamination and assure the collection of a sufficient sample to enable detection at the sub-ppb level.

E & E has identified the following local fish species as likely candidates for collection and analysis, based on their recreational value, food habits, life history, and body lipid content:

- Yellow perch (Perca flavescens),
- Green sunfish (Lepomis cyanellus),
- White bass (Morone chrysops),
- Yellow bass (Morone mississippiensis),
- Walleye (Stizostedion vitreum),
- Carp (Cyprinus carpio), and
- Channel catfish (Ictalurus punctatus).

Based on the results of its agency contacts, E & E will select four fish species for analysis. E & E proposes to target four local species for investigation because they will provide a representative cross section of species for analysis of body lipid content; and also will enable correlation of the data to a wider range of potential human consumers than would be possible if only one species were used. If the state departments of environmental conservation feel there is another appropriate species which E & E has not suggested, corporate specialists will evaluate the desirability of using the species based upon its recreational value, food habits, life history, and body lipid content.

Subtask 4B. The four selected target species will be collected at a total of six sampling stations along the Mississippi River, on both the east and west sides of the river, at the following three locations:

- Granite City Army Depot,
- Canal Island, and
- Jefferson Barracks Historical Park.

Sampling of both the east and west sides of the river is necessary because there may be different sub-populations of fish on the two sides, and because both the fish species and the fishermen that seek them may move from one side to the other at various times.

During the fish sampling, sediment samples will be collected at the same sampling locations.

Samples of the target fish species will be collected with scientific sampling gill nets. Two sinking gill nets will be set simultaneously on opposite sides of the river and left overnight. Mesh sizes in the eight-foot-deep nets will consist of 0.5-, 1.0-, 1.5-, 2.0-, 2.5-, and 3.0-inch bar mesh measurement panels. The panel lengths will be 50 feet. Five fish from each target species will be collected at each station, for a total of 30 fish from each species to be preserved for future analysis. All fish will be measured for fork length and weight. Each fish will be labeled, wrapped in pesticide-grade hexane-rinsed aluminum foil, placed in a plastic bag, and stored on dry ice until the sampling crew returns to shore and the samples can be frozen immediately. The fish samples will be shipped via Federal Express on dry ice to E & E's Analytical Services Center for processing prior to laboratory analysis by a contracted laboratory.

Sediment sampling will occur at the same time as the fish sampling. The sediment samples will be collected using a brass Ekman dredge or suitable ponar dredge. Selection of the sampling device will depend on the flow characteristics of the Mississippi River at the sampling stations. All details of the packing and handling will be specified in the work plan.

Fish samples will be prepared in E & E's Analytical Services Center. The sample analyses will include whole fish, as well as fillets: a total of four fillet samples and four whole fish samples from each of six stations. In all, 48 fish tissue samples (four species per station, whole fish and fillets, and six stations) will be analyzed.

The six sediment samples will be shipped directly to the selected laboratory for chemical analysis.

All 48 fish tissue samples and all six sediment samples will be analyzed for the previously identified target contaminants. The samples also will be analyzed for lipid content.

Task 5: Data Interpretation

E & E will compile and interpret all data collected during Tasks 1 through 4 and previous investigations--including all data on site history, hydrology, discharges, and environmental impacts that have occurred as a result of migration of contaminants from the Dead Creek sites--with the objective of delineating and documenting the population at risk and potential health effects.

E & E fishery scientists will use the data collected during the fish and sediment sampling/analysis, plus data concerning fish licenses, boat registrations, creel surveys, and fish landings, to describe use of the resource by the public at large. In addition, if information is available for fish population estimates, these data will be useful in establishing the total available levels of the respective contaminants. E & E also will describe other waterborne recreational activities such as waterskiing, swimming, and sailboarding. The resource use description will provide the information needed to evaluate public exposure levels and determine the need for a health advisory.

In the H/A mechanism report, E & E will present the analytical results of both the fish tissue analysis and sediment analysis. E & E toxicologists will interpret these results in their evaluation of the public health concerns.

Based upon levels of PCBs, dioxins, dibenzofurans, methyl mercury, and other substances detected in the Task 1 through 4 analyses and all other investigations, E & E will perform a risk assessment to evaluate the potential adverse toxicological effects on humans. Based on standard risk assessment procedures involving physiological parameters and absorption estimates, E & E will use the collected data to estimate the daily intakes or lifetime average daily doses (LADDs) for the populations at risk. E & E will use USEPA guidelines (49 FR 46294, November 24, 1984) to classify substances of concern as carcinogens or noncarcinogens. For substances defined as noncarcinogens, E & E will compare, as appropriate, daily intakes or LADDs to acceptable daily

Intakes (ADIs). For carcinogens, E & E will estimate the lifetime risk of cancer, based on unit cancer risks (UCRs) developed by USEPA from carcinogenic animal bioassays or epidemiological studies of exposed humans.

For this work, the evaluations of E & E in-house toxicologists and health specialists will be augmented by input from the firm's Health and Safety Advisory Committee, which includes nationally recognized experts in toxicology, public health, industrial hygiene, and the medical sciences.

The final report for the H/A mechanism activities will be prepared in a format that will be acceptable for submission, by IEPA, to the regional USEPA--for transmission to ATSDR for consideration toward issuance of an H/A including recommendation for dissociation of the population from the site.

4. SCHEDULE

The schedule for the revised scope of work pertinent to the HRS scoring mechanism is as follows:

Activity	No. Weeks	Schedule
Work plan modification	4	Weeks 1-4
IEPA review/approval of modified modified work plan, and simultaneous	4	Weeks 4-7
Water supply search	4	Weeks 4-7
Field investigations	23	Weeks 8-30
Final report	10	Weeks 31-40

The final schedule for the H/A mechanism activity, if needed, will depend on what is determine to be needed based on the HRS activities and results. In general, E & E anticipates that the H/A activities outlined herein could be completed in 22 weeks:

Activity	No. Weeks	Schedule
Geohydrologic study	5	Weeks 1-5
Sediment and seep sampling	2	Weeks 6-7
Fish and sediment survey	4	Weeks 8-11
Laboratory turnaround for fish and sediment survey*	6	Weeks 12-17
Report Preparation	5	Weeks 18-22

*The 45-day (six-week) laboratory turnaround for the geophysical study samples and the sediment/seep samples will occur simultaneously with other tasks and will not affect the project schedule.

5. COST

Table 5-1 summarizes E & E's estimated cost for the completion of the revised scope of work for the HRS scoring mechanism. HRS cost details are provided in Tables 5-2 through 5-6.

Table 5-7 summarizes E & E's estimated cost for the Health Advisory mechanism work. H/A cost details are provided in Tables 5-8 through 5-10.

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SITE NAME	SAUGET AREA 1
DOC ID #	458034 169655
DESCRIPTION OF ITEM(S)	TABLE 5 - 1, 5-7
PRP	RMD - SAUGET AREA 1
DOCUMENT VARIATION	___ COLOR OR <u> X </u> RESOLUTION
DATE OF ITEM(S)	N. D.
NO. OF ITEMS	1
PHASE	REM1, REM8
OPERABLE UNITS	
PHASE (AR DOCUMENTS ONLY)	___ Remedial ___ Removal ___ Deletion Docket ___ Original ___ Update # ___ Volume ___ of ___
COMMENT(S)	
HRS MECHANISM ACTIVITIES LABOR & COST ESTIMATE FRC 6907	

Table 5-1
HMS Mechanism Activities Labor And Cost Estimate

Labor Rate
Per Hour

Principal
Chief
Senior
Associate
Junior
Technician
Asst's Technician
Secretary

Totals	1	2	3	4	5
84	24	0	0	0	60
246	60	10	40	196	500
3,500	200	80	290	2270	640
1,910	0	0	0	1750	160
156	0	0	0	116	40
100	0	0	0	0	160
150	0	0	0	0	120
20	0	0	0	0	20
TOTAL HOURS	6,006	304	90	4,332	1,700

Task 1 Work Plan Revision
Task 2 Major Supply Search
Task 3 Air Monitoring
Task 4 Additional Investigations
Task 5 Final Report

1) Total Labor Dollars	\$94,437.50	\$5,344.44	\$1,340.40	\$4,931.70	\$57,004.24	\$24,936.00
2) Fringe Benefits	25.0%	23,609.40	1,336.11	335.10	1,232.93	14,471.06
3) Total Labor Cost		\$118,046.90	6,680.55	1,675.50	6,164.63	72,355.30
Overhead Rate -----)		65.0%	65.0%	65.0%	65.0%	65.0%
4) Overhead		\$76,730.55	4,342.36	1,089.00	4,007.01	47,030.55
5) Travel- Airfare		22,965.00	425.00	150.00	900.00	20,640.00
- Per Diem		13,050.00	75.00	125.00	700.00	12,040.00
- Lodging		23,400.00	120.00	240.00	1,440.00	21,360.00
- Auto Rental		13,200.00	0.00	200.00	400.00	12,600.00
Subtotal Travel		\$72,735.00	620.00	735.00	3,440.00	66,640.00
6) Subcontracts		\$101,559.00	0.00	0.00	0.00	101,559.00
7) Other Direct Costs:						
Personal Protection Disposables		33,576.00	0.00	0.00	010.00	32,766.00
Communication		650.00	200.00	50.00	0.00	400.00
Copy		600.00	50.00	50.00	0.00	500.00
Shipment Costs		4,000.00	0.00	0.00	0.00	4,000.00
Report Reproduction		1,300.00	300.00	0.00	0.00	1,000.00
Miscellaneous Supplies		7,000.00	500.00	500.00	2,000.00	3,000.00
Subtotal ODCs		\$47,926.00	1,050.00	500.00	3,610.00	39,766.00
8) Subtotal		\$416,397.53	12,692.91	4,159.50	17,221.64	327,351.25
9) SGAR (excluding subcontracts)	20.0%	\$80,322.79	3,554.01	1,164.60	4,022.06	63,221.03
10) TOTAL COST		\$500,120.32	16,246.92	5,324.10	22,043.70	390,573.00
11) FEE (on non labor)	5.0%	\$12,000.25	106.00	89.20	451.20	11,007.93
12) FEE (on other costs)	13.0%	\$53,410.90	1,834.21	460.03	1,692.56	19,865.87
13) Laboratory Analysis (EAE)		\$341,500.00	0.00	0.00	94,500.00	247,000.00
14) Equipment Usage (EAE)		\$0,475.00	0.00	0.00	2,050.00	4,425.00
14) Computer Usage (EAE)		\$0.00	0.00	0.00	0.00	0.00
15) TOTAL PRICE		\$879,506.55	18,108.42	5,873.33	120,737.46	673,751.69

Table 5-2

**DEAD CREEK PROJECT
EQUIPMENT USAGE
HRS ACTIVITIES**

	<u># Periods</u>	<u>Rate</u>	
(1) OVA	3 month	1,420/mo	4,260
(1) OVA	2 weeks	650/wk	1,300
(1) HNU	1 month	650/wk	625
(1) HNU	1 week	290/wk	290
(4) Hi-Vol Samplers	2 weeks	\$75/wk	600
(1) Calibrator Kit	2 weeks	\$75/wk	<u>150</u>
			<u>\$6,475</u>

Table 5-3

**DEAD CREEK PROJECT
LABORATORY ANALYSIS**

<u>EPA Priority Pollutants</u>	<u>Quantity (1)</u>	<u>Unit Price</u>	<u>Total</u>
Soil/Sediment	156	\$1,130	\$176,280
(2) Air--Filter Paper for Particulates	42	495	20,790
(3) Air--Polyurethane Foam Cartridge	42	790	33,180
(4) Air--Sorbent--Charcoal or Florisic	42	965	40,530
Water	68	1,040	<u>70,720</u>
TOTAL:			\$341,500

(1) Includes field blanks and duplicates.

(2) Includes inorganics and pesticides.

(3) Includes acid compounds, base/neutral compounds, and volatiles.

(4) Includes all priority pollutant organics.

Note: Pesticide/PCB confirmation by GC/MS can be done, if requested, at an additional cost of \$150 per water sample and \$180 per soil or sediment sample.

Table 5-4

**DEAD CREEK PROJECT
FIELD INVESTIGATION COSTS
SAMPLE ANALYSIS**

<u>Priority Organic Pollutants</u>	<u>Water</u>	<u>Soil/Sediment</u>	<u>Air</u>
Acid compounds	\$ 200	\$ 230	\$245
Base/Neutral Compounds	250	280	270
Volatiles	190	220	275
Pesticides	120	120	175
<u>Non-Priority Organic Pollutants</u>	*	*	
<u>Inorganics</u>	<u>280</u>	<u>280</u>	320
Total Cost Per Sample	<u>\$1,040</u>	<u>\$1,130</u>	

*Cost included in priority organic pollutant unit prices.

Table 5-5

DRILLING (SUBCONTRACT) COSTS

New Drilling Proposal (Using Unit Prices from Original Contract):

Site G:	2 wells (30'-35')	6 additional borings @ 20';	footage 180' - 190'
Site H:	4 wells (30'-35')	4 additional borings @ 50';	footage 320'-340'
Site I:	6 wells (30'-35')	3 additional borings @ 40';	footage 310'-320'
Site J:		3 borings @ 20';	footage 60'
Site K:		3 borings @ 20';	footage 60'
Site L:		4 borings @ 20';	footage 80'
Site N:		2 borings @ 40';	footage 80'
Site O:	5 wells (30'-35')	4 additional borings @ 20';	footage 240'
Site P:		6 borings @ 40';	footage 240'
Site Q:	8 wells (30'-35')		footage 240'-280'

Total Borings: 60; Total Max. Footage = 140'

\$38,400	=	Footage @ 1920' in Level B
1,600	=	Mobilization
8,050	=	Stainless Casing (875')
3,500	=	Stainless Screens (25)
1,500	=	Protective Steel Casings (25)
~ 8,400	=	Well Installation @ 60 Hours
~ 3,125	=	Well Development @ 25 Hours
~11,250	=	Decontamination Time @ 90 Hours
~ 840	=	Delay Time @ 8 Hours
<u>\$76,665</u>		

<u>\$ 4,500</u>	=	55-Gal. Drums (150)
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<u>\$81,165</u>	=	Subtotal, New Drilling
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Table 5-5 (Cont.)

Existing IEPA Wells:

12 weeks (30'-35') footage 360'-420'

\$ 5,460	=	Footage @ 420' in Level B (No Sampling)
3,864	=	Stainless Casing @ 420'
1,680	=	Stainless Screens (12)
720	=	Protective Steel Casings (12)
3,360	=	Well Installation @ 24 Hours
1,500	=	Well Development @ 12 Hours
2,250	=	Decontamination Time @ 18 Hours
840	=	Delay Time @ 8 Hours
<u>\$19,674</u>		
720	=	55-Gal. Drums (24)
\$20,394	=	Subtotal, Existing IEPA Wells
<u><u>\$101,559</u></u>	=	TOTAL ESTIMATED DRILLING SUBCONTRACT

Table 5-6
PERSONNEL PROTECTION DISPOSABLES

	<u>Cost Per Man-Day</u>	<u>Man-Days</u>	<u>Cost</u>
<u>Task 3</u>			
[REDACTED]	[REDACTED]	[REDACTED]	\$ 810
<u>Task 4</u>			
[REDACTED]	[REDACTED]	[REDACTED]	1,998
[REDACTED]	[REDACTED]		16,128
[REDACTED]	[REDACTED]		<u>14,640</u>
TOTAL:			<u>\$33,576</u>

10/14/80

Is it correct?
 1) Chief
 2) Senior
 3) Asst. Chief
 4) Junior
 5) Electrician
 6) Asst. Technician
 7) Secretary

Table 5-7
 H/A Mechanize Activities Labor and Cost Estimate

Labor Rate Per Hour	Tasks										Task 1		Task 2		Task 3		Task 4		Task 5	
	10	15	10	2	3	40	40	40	40	40	Geologic Survey: A. Well Install. B. Surface/Underwater Levels C. Broadwater Supplies		Sediment Sampling		Seep Sampling		Fish and Sediment Survey: A. Design Survey B. Fish and Sediment Sampling/Report		Data Interpretation	
Totals	12	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
1) Chief	12	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
2) Senior	0	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
3) Asst. Chief	12	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
4) Junior	12	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
5) Electrician	12	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
6) Asst. Technician	12	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
7) Secretary	12	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
10/14/80	1,917	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
1) Total Labor Dollars	82,615.10	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
2) Fringe Benefits	5,983.76	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
3) Total Labor Cost	88,598.86	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
Overhead Rate	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%		65.0%		65.0%		65.0%		65.0%	
4) Overhead	57,789.26	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
5) Travel - Airfare	3,300.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
- Per Diem	2,550.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
- Lodging	5,700.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
- Auto Rental	1,850.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
Subtotal Travel	13,400.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
6) Subcontracts	913,450.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
7) Other Direct Costs:																				
Personal Protection Disposables	4,000.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
Communication	450.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
Copy	345.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
Shipment Costs	1,000.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
Report Reproduction	0.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
Miscellaneous Supplies	6,000.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
Subtotal ODCs	13,410.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
8) Subtotal	829,000.16	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
9) SGA (excluding subcontracts)	821,144.52	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
10) 10/14/80	824,150.60	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
11) FEE (on materials)	84,850.34	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
12) FEE (on other costs)	98,104.71	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
13) Laboratory Analysis (E&E)	931,620.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
14) Equipment Usage (E&E)	12,050.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
15) Drilling Costs (E&E)	10.00	0	0	0	0	0	0	0	0	0	0		0		0		0		0	
15) TOTAL FEE	824,855.73	0	0	0	0	0	0	0	0	0	0		0		0		0		0	

Table 5-8

E & E LABORATORY ANALYSES

Task	No. of Samples	Unit Price	Total Cost
1. Water	6	280	\$1,680
Digestion	6	25	150
SUBTOTAL			<u>1,830</u>
2. Sediment	12	310	\$3,720
Digestion	12	25	300
SUBTOTAL			<u>4,020</u>
3. Water	6	280	\$1,680
Sediment	6	310	1,860
Digestion	12	25	300
SUBTOTAL			<u>3,840</u>
4. Sediment	6	310	1,860
Fish Tissue	48	390	18,720
Digestion	54	25	1,350
SUBTOTAL			<u>21,930</u>
GRAND TOTAL			<u><u>\$31,620</u></u>

Table 5-9

E & E LABORATORY UNIT PRICES

	Sediment	Fish Tissue	Water
PCB	\$120	\$175	\$120
Mercury	60	85	30
Cadmium	15	15	15
Lead	15	15	15
Methyl Mercury	<u>100</u>	<u>100</u>	<u>100</u>
TOTAL	<u>\$310</u>	<u>\$390</u>	<u>\$280</u>

Add digestion charge of \$25 per metal sample for cadmium and lead.

Table 5-10

**H/A MECHANISM
SUBCONTRACTING COSTS**

1. Laboratory Analyses (ETC, Inc.)

Parameters: Dibenzofurans/Dioxins

Task	Sample Type	No. of Samples	Unit Price	Total Cost
1	Water	6	\$1,100	\$ 6,600
2	Sediment	12	1,100	13,200
3	Water	6	1,100	6,600
	Sediment	6	1,100	6,600
				<u>\$ 13,200</u>
4	Fish	48	1,400	67,200
	Sediment	6	1,100	6,600
				<u>\$ 73,800</u>

Total ETC Subcontracting Cost = \$106,800

2. Expert Review
(Health and Safety Advisory Committee) \$ 15,000

3. Drilling Costs
Canoni, Inc.: 6 monitoring wells \$ 21,690
(2 nests of 3 monitoring wells)

TOTAL SUBCONTRACTING COSTS: \$143,490